

The Refrigeration Service Engineer

Vol. 3
No. 6

JUNE • 1935



Servicing the Dayton Refrigerator •
Improved Tools • Drying Methyl Chloride
Systems • Questions and Answers

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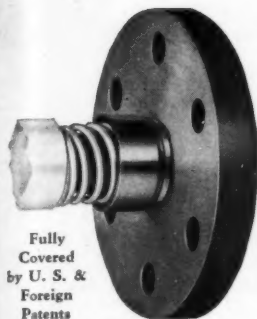
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The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of
REFRIGERATION UNITS and OIL BURNERS

VOL. 3.

JUNE, 1935

NO. 6

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PUBLISHED MONTHLY BY

NICKERSON & COLLINS COMPANY

433-435 NORTH WALLER AVE., CHICAGO, ILL.

EASTERN OFFICE: 149 BROADWAY, NEW YORK CITY

Publishers for 42 years of Technical Books and Trade Journals Serving the Refrigeration Industries.

Subscription: United States \$2.00 per year. Single copies 25c. All other countries \$3.00 per year.

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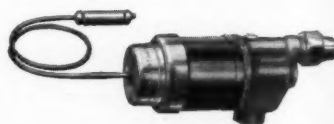
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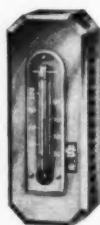
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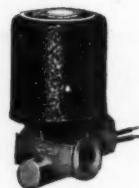
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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 3, No. 6

CHICAGO, JUNE, 1935

\$2.00 per Annum

Servicing The Dayton Refrigerator

The Operation and Servicing of Dayton Refrigerators.
This Unit Is the Conventional Single Cylinder Reciprocating Type of Compressor Using Sulphur Dioxide.

THE Dayton refrigerator, manufactured by Heinz & Munschauer, Buffalo, N. Y., is sold nationally by the Dayton Refrigeration Corporation of Buffalo, N. Y. The 1935 models include five sizes from 4.0 cubic feet to 8.04 cubic feet. The refrigerating capacity of all of the models is 85 lbs. I.M.E., and they are powered by a $\frac{1}{8}$ -hp. motor using sulphur dioxide as the refrigerant.

The compressor is of the conventional one-cylinder reciprocating type, belt driven, at 800 r.p.m., with $1\frac{1}{8}$ " bore by a $1\frac{1}{4}$ " stroke. The compressor is located below the food compartment. The refrigerant charge on the model 6-C-3 (or the 6.03 cubic foot job) is 4 lbs. 6 oz. Models 7-C-4 and 8-C-4 (the 7.04 and 8.04 cubic foot models respectively) has 5 lbs. of SO_2 . The other models (the 4 and 5 cubic foot jobs) contain 3 lbs. 6 oz., and lubrication for all models is $1\frac{1}{2}$ pints of Suniso No. 3 oil. The manual temperature control with wide cycle defrosting is of the Ranco make, while the Leland capacitor and repulsion induction motor is used. The

Mullins shell type evaporator is installed on this job, with the McCord fan cooled, fin tube condenser. Previous models will be found to be of the same general design as briefly described above.

Service Problems

In the servicing of the Dayton refrigerator, the following may be the causes of service complaints:

1. Noisy Compressor Unit

- A. Bolts not removed from base.
- B. Noisy belt. Belt too tight or out of line.
- C. Noisy motor, due to end play.
- D. Loose motor pulley or compressor pulley.
- E. Compressor pulley striking seal nut.
- F. Condenser loose.
- G. High head pressure due to air in system.
- H. Compressor low on oil due to leak in compressor.
- I. Noisy head valve.

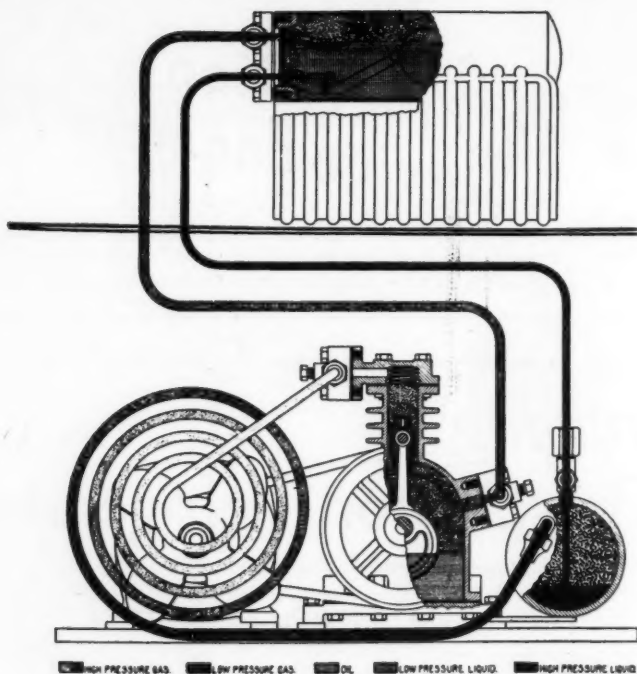


FIG. 1. DAYTON CYCLE OF OPERATION

2. Compressor Runs Continuously

A. Switch not properly adjusted. Box extremely cold.

B. Cooling unit not level, tipped too far forward. Indicated by frosting of suction line.

C. Heat leaking into cabinet due to leaky gasket around large door.

D. Low on gas due to leaks in system.

E. Dirt under discharge valve or improper seating of discharge valve.

F. Piston valve not closing due to dirt under valve or valve coming loose from stem.

G. Cooling unit pumped dry due to clogged screen or float valve stuck shut.

H. Float valve leaking due to dirt on seat or defective valve, indicated by very cold or frosted compressor.

I. Belt slipping, causing reduced speed of compressor.

3. Motor Does Not Run

A. No current

B. Requires Overload Protection.

C. Loose connection or short in wiring.

D. Brushes not making contact.

E. Compressor stuck due to moisture in system.

F. Motor burned out.

4. Compressor Runs at Short Intervals

A. Improper setting of control.

B. Slightly short on gas.

C. Discharge valve leaking due to dirt or defective seat.

Locating and Correcting Improper Operation

In order to ascertain what conditions are existing inside the refrigerator, we use the gauges. The low pressure, or compound gauge, is attached to the shut-off valve on the crank case of the compressor and the

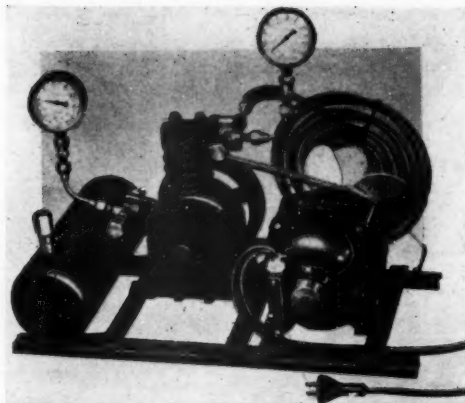


FIG. 2. GAUGES ATTACHED TO THE CRANK CASE AND HEAD OF COMPRESSOR TO ASSIST IN LOCATING TROUBLES

high pressure gauge is attached to the shut-off valve on the head of the compressor. These gauges can be used for locating and correcting troubles, such as improper setting of cold control switch; leaky discharge of piston valves, etc. See Fig. 2. Before connecting gauges, study cross section of the valve. Note the valve stem (Fig. 3) with the double seat. The purpose of this double seat is to enable a connection of gauges without permitting gas to escape during operation. Be sure the valve stem is screwed counter-clockwise as far as it will go, closing outlet to plug.

You can then remove the plugs and insert the $\frac{1}{8}$ " half union coupling to which you connect your gauges. A gas odor on the removal of the plug can be caused by a small amount of gas under pressure being in the valve compartment.

The correct gauge readings for all size boxes are "cut-in" at about 5 lbs. pressure and "cut-out" at about 8 inches of vacuum.

Pressure gauge should be attached to the condenser shut-off valve on top of the cylinder. Compound gauge should be connected to compressor shut-off valve on side of compressor.

Checking and Correcting Discharge Valves on CF-147 Compressors

To check discharge valve for leak, attach compound gauge and start compressor.

Close suction valve by screwing stem as far to the right as it will go, thus cutting off suction line of compressor.

When a vacuum of, say 20 inches, is reached stop compressor. Watch gauge for two or three minutes and if there is no movement of hand, discharge valve may be assumed to be holding.

If discharge valve leaks the hand on the gauge will immediately show a rising pressure on the scale. This is due to gas leaking from the condenser through the valve into the compressor.

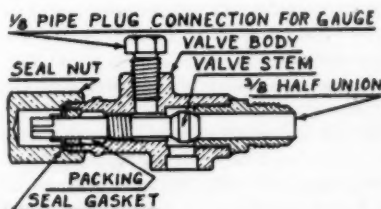


FIG. 3. VALVE CONNECTION

If discharge valve leaks it will be necessary to remove the compressor head. (See Fig. 4.) Examine valve and valve seat. Particles of dirt may be on the seat. Valve seat may need reseating. If valve leaks due to bad seat, there will be black marks around the valve seat. To reseal valve seat, use a

perfectly flat fine oil stone being careful to hold stone perfectly flat so as not to get a convex surface. Continue the stoning operation until all black marks have disappeared.

If discharge valve shows an excessive amount of wear, it is best to replace it with a new one.

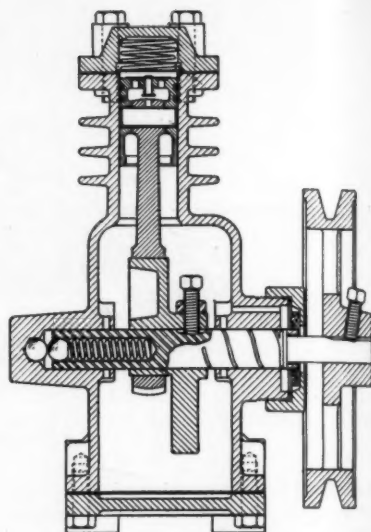
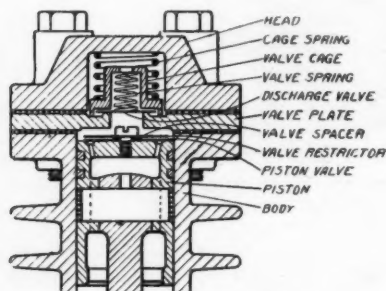


FIG. 4. COMPRESSOR HEAD AND DIAGRAM OF COMPRESSOR BODY

Checking and Correcting Piston Valves on CF-147 Compressors

While gauge is attached for checking discharge valve, the piston valve can also be checked at the same time.

If the compressor will not pull a vacuum after the compound gauge is attached and the compressor started, there may be dirt under the valve. It will be necessary to remove gas from the compressor in the following manner:

Remove the front from cooling unit and close suction valve "D" (Fig. 5) by removing seal cap and turning stem to the right as far as possible. Next close the opening where the gauge is attached by turning stem to the left as far as possible. Now, remove gauge and connect one end of a piece of hose or tubing, placing the other end in a pail of lye water. (One pound of lye will neutralize one pound of sulphur dioxide.) Close condenser shut-off valve "A" by turning to the right as far as possible. Now, turn compressor shut-off valve "B" about two turns to the right. This will allow the gas to escape from suction line and compressor.

Head can now be taken off and valves examined.

On the Model CF-147 compressor, remove the screw in center of piston which holds the piston valve assembly in place. Care should be taken not to lose the small spacing washer which is between the valve disc and restricting plate. This washer is to give the valve the proper amount of lift. Care should be taken not to bend this disc which is very thin, being made from .004 Swedish spring steel.

After the assembly has been removed, wipe the top of the piston with a rag to remove any dirt. Examine the disc for dirt. After the disc and piston are thoroughly cleaned, replace assembly, being sure burr on edge of disc is up, otherwise it will not seat. When replacing screw, be sure it is drawn tight.

The discharge valve is restricted to .0035 left, which is correct for quiet operation.

Next, turn valve stem on compressor shut-off valve "B" to the left as far as possible, which will close off the opening where the tubing or hose is attached. Remove tubing or hose and replace gauge. Open condenser

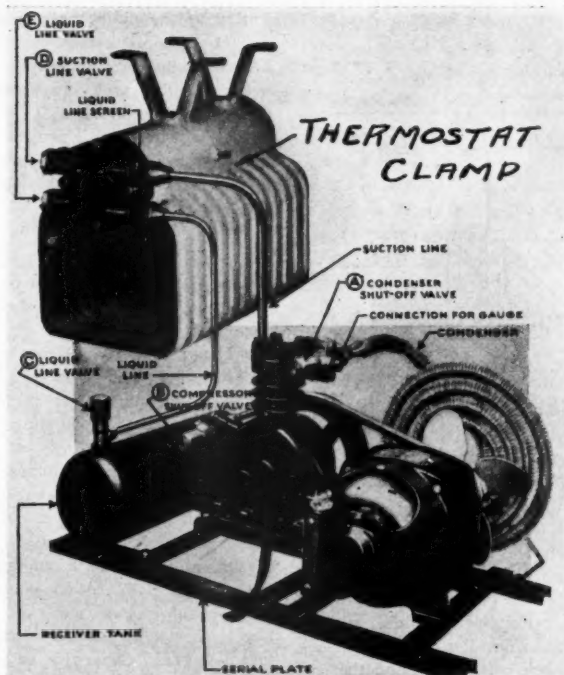


FIG. 5. COOLING UNIT AND COMPRESSOR ASSEMBLY

shut-off valve "A" by turning stem to the left as far as possible. Start compressor and if a vacuum can be pulled it may be assumed the trouble has been corrected. Open suction valve "D" on cooling unit and replace seal cap and front.

Leaky Crankshaft Seal

When the crankshaft seal is found to be leaking (can be detected by the ammonia smoke test) it is necessary to reseal the seal around the crankshaft. To do this proceed as follows:

Attach compound gauge. If gauge reads 5 or 10 lbs. above the "O" compressor must be started. Close suction valve "B" by screwing to the right as far as possible. This closes off the suction line and cooling unit. Watch gauge and when hand reaches 1 lb. pressure, stop compressor. Should compressor pull a vacuum before it is stopped, it will be necessary to open suction valve

slightly to allow gas to enter compressor until the gauge reads 1 lb. Should the gauge still show a vacuum, it will be necessary to allow the cooling unit to warm up sufficiently to produce "O" or 1 lb. pressure.

If the crankshaft seal is taken off with the gauge reading a vacuum, air will rush into the compressor and if pressure is more than 1 lb. considerable amount of gas will be lost.

Remove belt from compressor, unscrew square-head set screw in compressor pulley. The wheel can now be removed. Should it be stuck to the shaft, a wheel puller must be used. Never use a screw driver or some other instrument to pry pulley off as this injures the seal. After wheel is removed, unscrew the large seal nut by turning in a counter-clockwise direction with a pipe wrench.

To reseal seal use a fine grade oil hone.

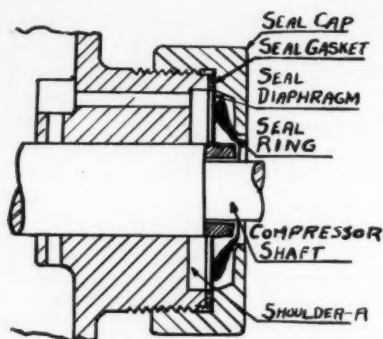


FIG. 6. SEAL ASSEMBLY

Hold the seal in one hand and with the hone in the other, hone the face of the seal using an oscillating motion (the surface of the hone must be perfectly flat—not concave or convex) until a bright smooth surface is obtained around the entire circumference. Next, take another seal and add a fine grade of grinding compound to the surface and polish shoulder of the crankshaft by oscillating motion of seal against shoulder, adding grinding compound occasionally until shoulder shows a smooth surface around the entire circumference. After this has been done the utmost care should be taken to clean all grinding compound from the shaft by means of a brush and gasoline, wiping thoroughly with a cloth. Surface of crankshaft shoulder must be free from the slightest scratches and should show a perfectly polished surface.

When replacing seal, shaft should be forced into compressor until shoulder of shaft is flush with "A" (see Fig. 6). If shaft sticks, turn slightly with wrench when applying force. If this is not done and seal assembly is replaced and nut drawn up tight, it will ruin seal diaphragm.

Moisture in System

If moisture enters the system and comes in contact with (SO_2) sulphurous acid (H_2SO_4) will be formed. This acid has a corrosive effect on all metal parts causing the piston to seize the cylinder wall. If only a small amount of moisture has found its way into the system, it is sometimes possible to break compressor loose by rocking

motion of the pulley and adding about $\frac{1}{4}$ pint of oil in crank case.

In extreme cases it will be necessary to remove cooling unit and compressing unit and completely overhaul. In this case do not attempt to install a new compressor with the old cooling unit, without completely cleaning cooling unit of sulphurous acid.

Air in System

Air will sometimes find its way into the system through the suction or low side on account of defective crankshaft seal, large flare nuts at compressor or cooling unit. Air is non-condensable gas and will cause high head pressure. This high head pressure causes loss of compressor efficiency and this in turn will cause a pounding noise and excessive running.

To detect air in system remove the $\frac{1}{8}$ " pipe plug on condenser shut-off valve "A" and attach pressure gauge. In a room temperature of 70° , this gauge should read 5 to 8 numerals less than room temperature or approximately 62 to 65 pounds pressure. This reading should never be taken unless box is thoroughly cooled down and cooling unit defrosted. Otherwise, an accurate reading cannot be obtained. The most accurate way is to attach a compound gauge and take the pressure reading when compound gauge reads "O."

If air is detected, shut compressor off and allow cooling unit to defrost. This will raise the pressure in the cooling unit and crank case of compressor.

After this has been done the points to be checked for leaks are as follows: Crankshaft seal, base of compressor, around flare nut and valve "B" on compressor, around head of cooling unit, also flare nut and suction valve of cooling unit.

Purging System of Air

To purge air out of system shut off compressor and allow it to remain idle until compressor head is cool. Detach pressure gauge and turn stem on condenser shut-off valve slightly to the right allowing air to escape (air, being lighter than sulphur dioxide gas, rises to the top). If a considerable amount of air is to be discharged, one end

of a piece of tubing or hose should be attached where the pressure gauge was removed. The other end should be placed in a pail of lye water.

How to Add Sulphur Dioxide

When the system is short of gas, the compressor will run continuously with little or no refrigeration, and there will be a hissing sound in the cooling unit resembling air being blown through water.

Before adding sulphur dioxide check entire system for leaks.

If system is short of sulphur dioxide proceed as follows:

Remove cap "B" from compressor shut-off valve and try valve stem to be sure it is backed all the way out. Now remove the pipe plug and insert a $\frac{1}{4}$ " half union coupling. Attach one end of a short piece of tubing to this connection, the other end to the service tank and open valve on cylinder and crack flare nut at compressor, purging the air out of the tubing. Start compressor and screw stem of compressor to run for about ten minutes. At the end of this time back stem of compressor shut-off valve out against back seat. If symptoms pointing to insufficient gas in system have disappeared, close valve on cylinder and detach tubing, replacing pipe plug. If not, repeat the operation.

How to Add Oil

Remove face plate from cooling unit and close upper shut-off valve by screwing stem to the right as far as possible. Start compressor and allow it to run for about one minute. Next remove pipe plug from compressor shut-off valve (first being sure the valve stem is backed all the way out). Insert $\frac{1}{4}$ " half union and attach a short piece of $\frac{1}{4}$ " tubing. Pour about $\frac{1}{4}$ pint of oil in an absolutely dry and clean vessel and insert tubing, touching bottom of same. (This should be special dehydrated refrigerator oil.) Open compressor shut-off valve about one-quarter turn, allowing oil to be drawn into compressor. Valve should be shut off before oil level reaches end of tubing.

Clogged Screen or Float Valve Stuck

If the screen is clogged or the float valve is stuck shut, all the refrigerant in the cool-

ing unit will be pumped into the receiver tank. This condition will cause the cooling unit to be warm while compressor is running continuously. When this occurs it is usually traceable to a clogged screen or the needle point of the float valve being wedged into its seat.

To examine screen, remove the face plate from the front of the evaporator by taking out the four screws. Remove the seal cap from the shut-off valve (see Fig. 5) and close lower or liquid valve by screwing stem to the right as far as possible. With an alcohol torch heat the entire length of the liquid line back to the receiver tank. Unscrew flare nut of liquid valve on cooling unit. The screen can be removed by unscrewing the large nut on end of liquid valve.

If screen is very dirty clean thoroughly by washing in gasoline and replace. Sometimes it will be found that the screen has been torn allowing the dirt to enter the float valve. In this case it will be necessary to remove head from cooling unit and thoroughly clean float valve body as well as liquid valve. This can best be done by unscrewing float valve from head and washing the parts in gasoline and, if possible, using air to blow them out.

If screen is found to be clean, hold finger over end of liquid valve (after screen has been replaced and screwed up tight) and open liquid valve to see if there is a pressure or vacuum in cooling unit. This should always be done before attempting to remove head. If not done and there is pressure in the unit, there will be considerable damage caused. When making this check be sure cooling unit has no frost on it. If the screen is clean, it is almost a sure sign that the float valve is stuck.

If the float valve is stuck, loosen by taking a small piece of wood placing end of grain against liquid shut-off valve and strike with sharp blows with a small hammer. This is usually successful in loosening needle from seat permitting float ball to drop and liquid to flow into cooling unit until proper level is reached, at which point float valve will be shut off. If this method is not successful it will be necessary to remove the head from cooling unit. The float assembly can now

be removed and examined; care should be taken not to injure any of the parts as this is a delicate part of the system. When replacing head, a new lead gasket should always be used to insure a gas tight joint.

How and When to Adjust Float Valve

If it is found that the suction line is frosting this is an indication that the float is set too high and is causing liquid to be drawn into suction line. With the $\frac{1}{4}$ " socket wrench give the stem about one-sixteenth of a turn in a *clockwise* direction. The job should be allowed to make at least two cycles before further adjustment to be sure that the excess liquid has been removed. If, at the end of this time there is still an indication of frost, give the stem another sixteenth of a turn. Should the stem have to be turned more than three-eighths of a turn from the original setting, it is an indication that dirt has become lodged between the needle and the seat or the needle is not seating properly, in which case further adjustment will do no good as this lowers the liquid level approximately $\frac{3}{4}$ ". Never give adjusting stem more than one-half turn from the original setting as further movement would jam the float valve against bottom of float valve chamber.

If compressor is short of oil it is due to the oil accumulating in the evaporator and not returning. In this case, stem should be turned in a *counter clockwise* direction until frost appears on the suction line. You will then know that the oil has been drawn off. Then turn in a *clockwise* direction just far enough to where the job will operate without frost appearing on suction line. Never turn adjusting stem more than one-half turn in a *counter clockwise* direction from the original setting.

How to Remove Compressor, Compressor Head or Crankshaft Seal

Before taking head from compressor, attach compound gauge and see that compressor has between "0" and 1 lb. pressure reading in the crank case. The object of pressure rather than vacuum is to make certain not to draw air or moisture into compressor when taking head or crankshaft seal off.

If gauge reads 5 or 10 lbs. above "0" com-

pressor must be started. Immediately close suction valve by screwing to the right as far as possible. This closes off the suction line and cooling unit. Watch gauge and when hand reaches 1 lb. pressure stop compressor. Should compressor pull a vacuum before it is stopped, it will be necessary to open the suction valve slightly to allow gas to enter compressor until the gauge reads 1 lb. Should the gauge still show a vacuum it will be necessary to allow the cooling unit to warm up sufficiently to produce "0" or 1 lb. pressure. When compressor has stopped, close the condenser shut-off valve by turning to the right.

Being certain of the above, you can safely remove the compressor or any part of it without danger of losing gas or of air being drawn into the system.

J. P. McLean,
New York.

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The publication is improving steadily and I take this opportunity of wishing you continued success with it.

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Enclosed find check for subscription to the REFRIGERATION SERVICE ENGINEER. I think it is about the best publication devoted to refrigeration I have ever read.

A Good Mechanic Is Known by the Tools He Uses

Improved Tools Have Made Improved Service

Progress Has Been Made in the Design of Service Tools in
Keeping with the Improvement of Refrigeration Servicing.

By CLARENCE E. HAMILTON *

OUT with the old and in with the new!

This is merrily shouted New Year's Eve by all. The message conveyed is *progress*; advancing to a new year. But this is a periodical progress, occurring once a year. In this industrial and mechanical age, progress, advancement and improvement wait not for a given date but occur every day of the year. The profession of servicing and installing mechanical refrigeration equipment has now been practiced for many years by a great number of men. This profession has progressed to the point of becoming a specialized science requiring that a man have a thorough knowledge of the subject of refrigeration and his being equipped with the tools that have been specially designed for this particular field of work.

Specially designed tools for the refrigeration service man have not always been available, however. The pioneers of the industry were, for the most part, forced to adapt such tools as were already manufactured for other lines of mechanical work to their needs. Some of these tools that were found in the pioneer's tool box are: pliers, door springs and hammer. These tools still have their uses today, but are not called upon to perform all the diversified duties of the earlier days.

Figure 1 brings back memories to many and illustrates the use of some of the above mentioned tools. The writer can, figuratively speaking, hear some old timer say, "Give

me tools like these any day in the week in preference to the new fancy ones now on the market." But these so-called "new fancy" tools are on the market for a reason; the demand for tools that will enable a man to do his work faster, easier and with greater uniformity.

Figure 2 illustrates typical tube cutters of the present day and Figure 3, modern flaring tools. These pieces are small, compact, not bulky or cumbersome and have been designed to perform a particular duty when used by the refrigeration service man. These two items first appeared on the market as separate pieces, but are now obtainable in kit form as shown in Figure 4; a flaring block and yoke, a tube cutter, and an extra wheel for the tube cutter being packed in an attractive, serviceable green colored metal box. This is a step forward, as the metal box protects these tools from damage when packed in a tool box along with many other tools.

When a valve stem is broken or the machine manufacturer has not provided a needed shut-off valve, the pinch-off tool illustrated in Figure 5 does a much better job of closing off a line than a pair of pliers or a hammer, especially if it is necessary to be able to again open up the line. Pinch-off tools have their limitations, however, as tubing over $\frac{3}{8}$ inch outside diameter cannot successfully be pinched shut and then opened up again. This tool may be had with either wing nuts or with hex head bolts for drawing

* Engineer, Utilities Engineering Sales Co., Chicago, Ill.

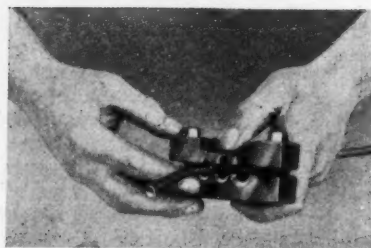
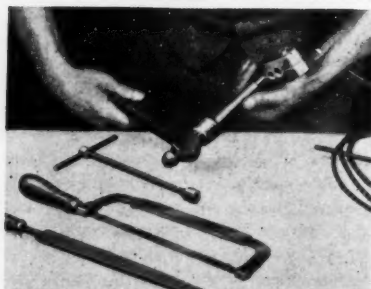
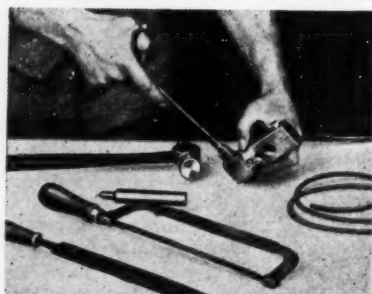
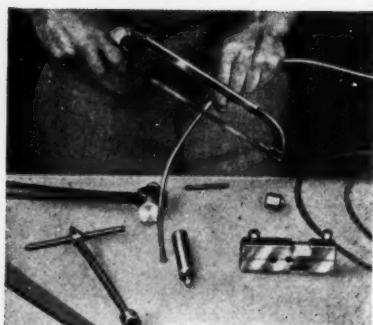


FIG. 1. THIS OLD METHOD OF MAKING A FLARE BEFORE MODERN TOOLS WERE AVAILABLE, SHOULD RECALL FOND RECOLLECTIONS.

June, 1935

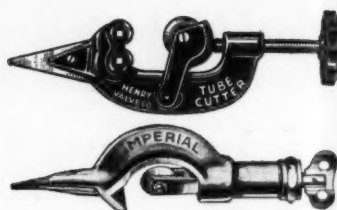


FIG. 2. TYPES OF TUBE CUTTERS.

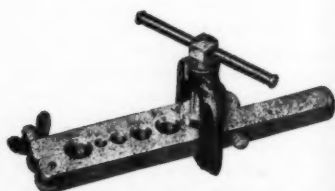
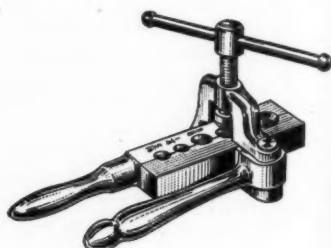


FIG. 3. TYPES OF FLARING TOOLS.

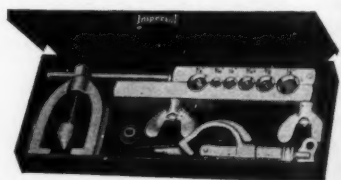


FIG. 4. TUBE CUTTER AND FLARING TOOL COMBINATION OUTFIT.

the two sections of the tool together when clamped over a piece of tubing. One manufacturer of this type of tool provides two rounded sections between which the tubing is pinched instead of the beveled sections shown in the tool illustrated.

Many types of mechanical tube benders have appeared on the market, some to stay and others to be discarded for various reasons. Mechanical tube benders make a



FIG. 5. PINCH-OFF TOOL.

bend that can hardly be equaled by hand bending, but price, ranging from \$3.00 to \$15.00, has been the governing factor in eliminating this item from the tool kit of the average serviceman. Spring tube benders of the type illustrated in Figure 6 are more commonly used as they are low in cost and efficient and practical on all tubing sizes up to $\frac{1}{2}$ inch O. D. The spring type tube bender is slipped over the outside of the tubing to the point where a bend is to be made. In



FIG. 6. SPRING TUBE BENDER.

using, it is suggested that the tube be bent to a little greater degree than is wanted and then straightened out again until the tube assumes the desired bend. This makes it comparatively easy to remove the tube bender by pulling on the belled mouth of the spring. If the above procedure is not followed, there is binding between the spring and tube, making it difficult to remove the bender.

It has been common practice, in the past, for the service man to carry a 25 foot roll of $\frac{1}{4}$ inch O. D. copper tubing for use as a purging line. Today, most of the men in the field are switching to a rubber purging hose, a section of which is illustrated in Figure 7, that can quickly be unrolled and run to any point and then easily coiled up again when

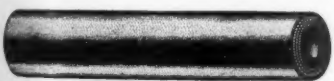


FIG. 7. SECTION OF CHARGING HOSE.

no longer needed. A rubber hose is convenient to handle and is not subject to becoming kinked. Flexible charging hoses, as well as purging hoses, may now be had. These are of heavier construction than the purging hose because of the higher pressures

which they must withstand, and are made of synthetic rubber, metal, fabric or a combination with metal, depending upon the manufacturer. By using a flexible charging connection, and hanging the refrigerant drum from a small hand scale, it is a simple matter to check exactly how many pounds of refrigerant is being charged into a system, thereby eliminating guess work.

Did you ever need a gasket and did not have one ready cut of the desired size on hand? Many times. Frequently the gasket was cut, for example, by placing a piece of gasket material on the compressor head and cutting it out by the use of a ball pein hammer and pen knife. The gasket cutting kit shown in Figure 8, combined with a pair of shears for long straight cuts, makes it possible to quickly and accurately cut one or more gaskets that will fit exactly, and will be the same where more than one gasket of a kind is required. Asbestos, rubber, cork, felt, lead or No. 8 metal gasket material may be cut with the tools in this set. Straight edges, curved blades and hole punches of various sizes make it possible to duplicate most any gasket.



FIG. 8. GASKET CUTTING KIT.

While on the subject of gaskets, let us not forget the door gasket, the replacement of which has been a profitable source of revenue to many. Much of the heat leakage in old refrigerators is due to worn out gasket material that no longer seals when the door is closed. Replacement of this worn out gasket by new creates work and profit for the service station and is of direct benefit to the customer for, when the heat leakage is decreased, operating costs are reduced because of the shorter running periods of the machine. This is not news, but is rather an

expression of a known fact. However, you may not have been "pushing" the sale of new gasket material to your customers as you should. When you go after this business, see that you have modern tools to work with and not a hammer and some tacks which belong to a past era. Why? Because time is money and the refrigeration season is short, so that each job must be completed as quickly as possible and yet in a manner that will be entirely satisfactory to your customer. Figure 9 illustrates a modern gasket tacker that will enable you to do just this. The particular tacker shown is operated by holding



FIG. 9. DOOR GASKET TACKER.

it firmly against the door gasket material and striking the rubber covered knob to release and drive home a tack. Other tackers on the market contain a spring and plunger that can be operated by merely squeezing the handle of the tacker to drive the chisel pointed tacks employed. This arrangement leaves one hand free to hold the gasket material or refrigerator door. This tool soon pays for itself when any volume of work is done, and can also be used for tacking shipping tags on boxes, for tacking crepe paper used in window trimming and can be taken home to tack the shades to rollers when they are turned during the spring cleaning season.

No doubt, the most used tool in the service man's kit is the ratchet wrench, one type of which is illustrated in Figure 10. Many styles of ratchet wrenches are now avail-

able on the market, but all are superior to the pieces of flat steel bar with a $\frac{1}{4}$ inch square eye that were frequently used in the early days of refrigeration. Stampings or forged wrenches may now be had, some with a reversing mechanism so that the wrench need not be removed from a valve stem to turn it from the right to the left or vice versa. The service man's kit would be sadly incomplete if it did not contain a good ratchet wrench; even you old timers, I believe, will



FIG. 10. RATCHET WRENCH.

agree with me on this. The most common size cap screw used on small refrigeration equipment is $\frac{5}{16}$ inches, measuring $\frac{1}{2}$ inch, and several ratchet wrenches, now available, have a socket on the handle of this size, thereby further increasing the usefulness of this tool.

The packing gland socket, shown in Figure 11, goes hand in hand with the ratchet wrench as it has a $\frac{1}{4}$ inch square shoulder so that it may be fitted into the eye of the wrench. This tool is used in tightening the packing gland on valves made by a number of valve manufacturers and used on many machines and, therefore, finds universal use.



FIG. 11. PACKING GLAND RATCHET WRENCH.

Figures 10 and 11 do not completely solve the wrench problem for the service man however. Many makes of machines are now on the market, and oftentimes some other size than a $\frac{1}{4}$ inch square socket is required for a



FIG. 12. MASTER MECHANIC'S SET.

certain valve stem, or the packing gland may differ from the one that could be tightened with a wrench such as is illustrated in Figure 11. Some of the valve stems measure $3/32$ inch, some $7/32$ inch and others are recessed so that the ratchet wrench alone cannot get to the valve stem. Some valves have a packing gland that requires the use of a wrench having prongs that will engage with the provided slots in the packing gland.

Wrench kits are now available with sockets to take care of all these variations. Proud is the man who owns one of the Master Mechanic Sets, Figure 12, for he is "all set" and need not worry about the size of the valve stems on the machines he is called upon to service. The pipe wrench will not be brought into play to turn valve stems where



FIG. 13. JUNIOR SERVICE SET.

he is concerned; no more rounding off of valve stems to be an everlasting curse. The large set differs from the Junior Service Set, Figure 13, in that it contains three box wrenches that will fit a large percentage of the cap screws used on domestic and small commercial machines and has a forged ratchet wrench, whereas the Junior Set has a stamping; both have reversing mechanisms.

Invariably, a search of a service man's pockets will uncover a thermometer. If it isn't there it should be, for all refrigeration work is centered around temperature. For the most part, in discussing refrigeration or refrigerating equipment, pressures are most commonly talked of, but temperature and pressures are directly related and "temperature" is the important thing. One popular style of thermometer is illustrated in Figure 14, which comes with a metal carrying case that is provided with a

clip to securely hold it in the pocket of the service man. Red spirit and mercury filled thermometers can be supplied by the various manufacturers of this item. Generally, the mercury thermometer is quicker acting; the red spirit easier to read. The temperature of a domestic cooling unit is usually taken by placing the thermometer in one of the ice cube trays.

However, the writer saw a neat clamp arrangement recently that a service man had designed for his own use to enable him to quickly attach a thermometer to the coils of a cooling unit. A double clamp, similar to ones sold to clamp a thermostat bulb to a cooling unit, was revamped as follows: The two small bolts and nuts used to hold the two sections of the clamp together were removed and replaced by two bolts about one inch long. A coil spring had been slipped over the bolts, the spring exerting pressure against the head of the bolt and one side of the clamp. This made it possible to separate the two sections of the clamp and snap it over a coil of a cooling unit, the spring holding the assembly firmly in place without the necessity of tightening any nuts. A two inch length of $1/4$ inch O.D. tubing had been pinched closed at one end and soldered to the clamp. When the assembly was used, the thermometer was inserted in the tube. The whole arrangement makes it possible to get an accurate reading of the temperature of the coil in a very short time. The temperature scale of the thermometer is visible down to about zero at all times, so that the trouble of putting the thermometer in an ice cube tray and taking it out again several times to get a reading is eliminated.



FIG. 14. POCKET THERMOMETER SET.

The above described tools indicate, to some extent, the progress that has been made in the tools available to the refrigeration industry. Tools such as these, together with gauges, commutator resurfacers, leak detector torches, etc., make up the equipment of a well-equipped service man or service station. All men engaged in this work may not

be able to afford to have as complete a set of tools as they would like to have. But that is a question!

Maybe he cannot afford to be without them because time is money and good tools will soon pay for themselves in the time saved on each job. Work quickly done, with a minimum loss of time, is as much appreciated by

the customer as is efficient thorough work. Speedy work enables one to do a greater number of jobs in a given period of time, or will allow more time for soliciting new business. Look over your tool box today and see if you have all the tools there that you should have—be honest with yourself when you do this.

Drying Methyl Chloride Systems

The Importance of Proper Dehydration for Methyl Chloride Systems Is Recognized by Every Engineer. In This Article Are Given the Various Methods Which Have Been Employed.

By E. W. McGOVERN *

ALTHOUGH Methyl Chloride as purchased is of very low water content, being manufactured to a specification of 0.01% by weight, or less, of water, in service practice it is advisable to dry a system after charging because of moisture that may be introduced in the charging process, moisture in the lubricant, or moisture already present in the machine.

The primary reason for removing such water is because quantities of water above a few hundredths of one per cent will tend to separate as ice at the expansion valve and thus affect the proper functioning of the machine. Larger quantities of water may freeze up the refrigerant line.

A secondary reason is to avoid possibilities of corrosion. Under ordinary conditions, Methyl Chloride is not acid and does not form acid when in contact with water, hence it is relatively non-corrosive to common engineering metals. But zinc, aluminum and die castings may be classed as exceptions, since some corrosion of these metals may take place in the presence of even small amounts of water. Also, in addition to water itself being corrosive, if Methyl Chloride and

water are in contact over a long period of time at higher temperatures, they may form small amounts of acid and therefore cause corrosion.

Methods of Drying

In factory practice, smaller machines can be efficiently dried before charging in a vacuum oven taking the entire assembly, but this method is not suited for regular service work.

Fair results may be obtained by flushing with Methyl Alcohol (Methanol) and then blowing out with *dry* air or Methyl Chloride gas, but it is best that even this be followed by chemical drying, as described below, after refrigerant has been charged.

In general service practice, chemical drying is sufficient unless very large quantities of water are present in a system, in which case the Methyl Alcohol flushing above described should be used.

Chemical Drying Agents

Drying agents should be in the form of coarse granules, and should be used in connection with an efficient filter such as mineral wool, to prevent passage of finely divided or

* R & H Chemicals Dept., E. I. du Pont de Nemours & Co., Inc.

disintegrated material into the refrigeration system. It is not practicable to reactivate any of the drying agents that are used in refrigeration systems.

Anhydrous Calcium Chloride has been widely used as a drying agent for Methyl Chloride systems, but with varying success. While there is no objection to it from the standpoint of drying efficiency, its use is not recommended because of its tendency to induce corrosion in the refrigeration system, especially at the expansion valve. The sources of practically all cases of corrosion in Methyl Chloride systems have been traced to the use of Calcium Chloride as drying agent. In spite of this, Calcium Chloride is often used without trouble for drying Methyl Chloride systems, but its use must be attended with special care. It should not be permitted to absorb more water than would form the monohydrate—an amount equal to 16.2% by weight of the Calcium Chloride charge. Also, a Calcium Chloride dehydrator should not be left in the system for more than a few days.

Calcium Oxide will not cause corrosion, and, as a matter of fact, it may prevent corrosion by virtue of its ability to neutralize acid that may be in the system. Its maximum water absorbing capacity is 32.1% of its own weight, but it should not be depended upon to take up more than about half of this because of the desirability of being on the safe side, and keeping the dryer in an efficient condition, as well as its tendency to disintegrate to a fine powder on taking up water. This latter tendency is its only disadvantage, as the fine powder may pass into the refrigeration system unless an efficient filter is used. When stored prior to using, Calcium Oxide should be kept in air-tight cans. United States Patent 1,809,833 (issued to Chicago Pneumatic Tool Co.) claims the use of Calcium Oxide in refrigeration systems.

Soda Lime, which is a mixture of Calcium Oxide and Caustic Soda, also has been reported as being very satisfactory for drying Methyl Chloride. It both absorbs water and neutralizes acid and, in addition, probably has much less tendency to disintegrate than does straight Calcium Oxide.

Activated Alumina, which is a special form of Aluminum Oxide, is a satisfactory drying agent for Methyl Chloride systems, but it does not absorb as much moisture as the above substances. While its tendency to disintegrate to a fine dust is not as great as that of Calcium Oxide, nevertheless, as with all chemical drying agents, trouble may result if it is not used in conjunction with suitable filters.

Neither *Magnesium Perchlorate* nor *Barium Perchlorate* should be used as drying agents for Methyl Chloride, as they may be the cause of dangerous explosions when employed for this purpose.

The use of *Methyl Alcohol* as an anti-freeze in Methyl Chloride systems is claimed by United States Patent, 1,570,080, issued to Roscoe R. Stitt. Because Methyl Alcohol does not remove the water but leaves it in the system where it may be a source of corrosion, its use is recommended only as a temporary measure for opening up systems which may be partly but not completely frozen up.

Various other drying agents have been suggested for Methyl Chloride, but there are not enough data available concerning them to enable us to unqualifiedly recommend any of them. Among these are:

Barium Oxide should have all the advantages of Calcium Oxide, to which it is chemically similar, but it is probably more expensive and, at least at present, not as universally available.

Anhydrous Calcium Sulfate probably would be satisfactory from a drying standpoint, but it would not neutralize acid. A combination of Anhydrous Calcium Sulfate and a small amount of Calcium Oxide would probably prove satisfactory.

Silica Gel is of a type similar to Activated Alumina. While it undoubtedly has good drying properties, it would not neutralize acid and is comparatively expensive.

Caustic Soda and Caustic Potash would dry and neutralize Methyl Chloride systems, but they probably would be unsatisfactory in refrigeration practice because of difficulty in handling and their tendency to quickly form water solutions.

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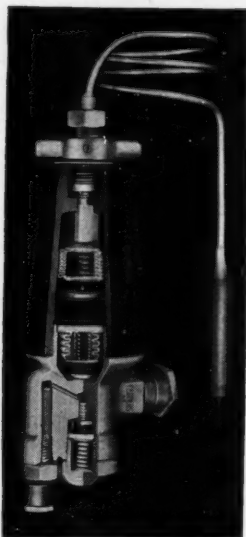


**FEDDERS
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VALVE**

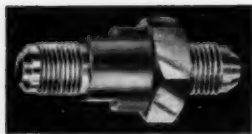


**FEDDERS
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SNAP-ACTION VALVE**

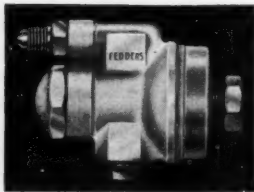
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K. Henry Morck
Chief Inspector

????????????????

THE Question BOX

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.

????????????????

THE following questions submitted to this department are answered by Mr. George H. Clark, chairman National Educational and Examining Board, Refrigeration Service Engineers Society. Have any readers other opinions regarding the problems involved. Send them to the Editor.

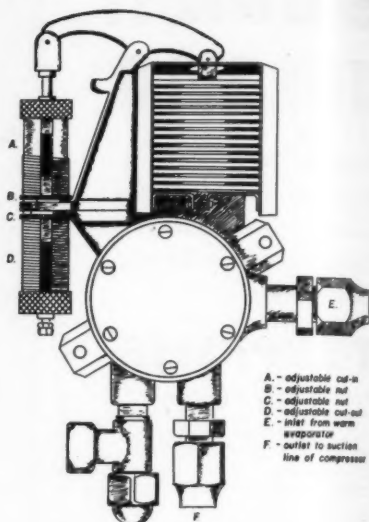
Evacuating Copeland

Question 73. *Is it successful to evacuate Copeland equipment of methyl chloride or Isobutane, whichever the case may be, completely clean, place in an oven and dehydrate and charge the outfit with sulphur dioxide?*

ANSWER: The Copeland system may be completely dehydrated and charged with new oil and used with sulphur dioxide. With sulphur dioxide, the machine will have 80% more capacity at the same speed than it formerly had operating with Isobutane. The motor will be correspondingly overloaded unless pulley sizes are changed to give a lower compressor speed. The Copeland Isobutane compressor has a 2-inch bore. A smaller bore compressor designed for methyl should have its speed increased 50% to get the same capacity with SO₂ that now obtains with methyl.

Frigidaire "Snap Action" Two-Temperature Valve

Question 74. *Please send instructions for operating and adjusting the Frigidaire two-temperature control valve. If possible, send a rough drawing showing the cross-section of this valve.*



FRIGIDAIRE "SNAP ACTION"
TWO-TEMPERATURE VALVE

ANSWER: If the valve referred to is the one known as the Frigidaire "snap action" two-temperature control valve, the method of operating and adjusting is as follows:

The sketch shows that the side opening from the valve body is the inlet from the suction line of the warm evaporator on the two-temperature system. The bottom connection is the outlet from the warm temperature evaporator to the suction line of the system. The valve on the lower left-hand part of the valve body gives a connection to which a gauge may be attached which will measure the pressure in the warm evaporator. The purpose of the valve is to give a pressure regulation in the warm evaporator entirely independent of the pressure regulation of the colder evaporators on the system.

A toggle action valve operates from the warm evaporator pressure in the bellows of the valve and from spring force regulated by two adjusting nuts as shown at the left of the sketch.

The upper adjusting nut of the two regulates the valve for cut-in pressure. The higher up the adjusting nut is turned, the higher will be the cut-in pressure. The lower

adjusting nut adjusts the cut-out pressure. The farther down the lower adjusting nut is turned, the lower will be the cut-out pressure; so that raising the upper nut or lowering the lower nut, or a combination of both, tends to increase the differential between the cut-in and cut-out pressures.

The valve may be adjusted by means of a gauge at the service valve on the bottom of the valve body. This valve may thus be regulated to maintain a cut-in and cut-out pressure for the warm evaporator in the same manner as you would regulate a pressure control, provided that the warm evaporator were hooked directly to the condensing unit.

Boat Refrigeration

Question 75. Kindly inform me of the cheapest way to have refrigeration on a boat. I have a four cubic foot Kelvinator and was going to use a small gasoline engine which I was going to use on the compressor. This cabinet was used in an apartment house where there were ten cabinets on the unit, which was in the basement. I have not seen the box yet so I do not know what kind of an evaporator it has.

ANSWER: In my estimation, the cheapest method of obtaining refrigeration on a boat would probably consist in driving a compressor from the power plant of the boat in storing refrigeration for a period when the boat's power plant is not in operation.

I would suggest that a brine tank be used, which may be installed in the refrigerator to be cooled, and this brine tank should be filled with a eutectic solution of barium chloride and water. This solution of barium chloride and water consisting of 23% barium chloride and 77% water, by weight, will have a freezing temperature of approximately 17°.

If a brine tank having a brine capacity of 50 to 100 lbs. of brine is used, the refrigerating machine can store up refrigeration to approximate 50 to 100 lbs of ice. The temperature at the surface of the evaporator will remain practically constant during the whole period that the eutectic solution of barium chloride is freezing or melting.

In all probability, a water-cooled condenser might very easily be used.

When the evaporator was completely refrigerated, which would be shown by the

temperature in the evaporator being chilled below 17°, or say when the evaporator got down to a temperature of 10°, the belt might be slipped off the compressor pulley and the machine allowed to remain shut down until more refrigeration was needed.

I am assuming that the boat is engine driven, but if not, a gasoline engine used in conjunction with the brine tank filled with the eutectic freezing solution would probably be the next most satisfactory installation.

Ice Cube Freezing

Question 76. The ice trays in two different refrigerators are filled with the same amount of water at the same temperature and at the same time.

Both units are identical in construction and equipped with identical units, one located in a 70° and the other in a 50° room. Which will freeze water in the shortest time? Why?

ANSWER: In all probability, the refrigerator located in a 70° room will freeze ice quicker than the refrigerator in the 50° room. The refrigerator in the 70° room will have a higher percentage of operating time and thus will cause the evaporator to remove heat from the water in the trays a greater percentage of the time and consequently cause quicker freezing.

One exception to this is in the case of a refrigerator where the evaporating temperature is low and the heat conductivity between the ice trays and the refrigerant is so good that the refrigerator in the 50° room will not cycle until after the ice is frozen. A similar machine in a 70° room will require a greater amount of refrigeration in the cabinet and the water will get less of the available refrigeration, and consequently the water will freeze faster in the refrigerator in the 50° room.

I have had occasion to test for ice freezing time in a 100° room and in an 80° room. In that particular case, the refrigerator operating in the 100° room operated continuously until the ice was frozen. The refrigerator in the 80° room cycled not long after the water was first put in. The ice freezing time in the 100° room was not much more than half the ice freezing time in the 80° room.

Carrier-Brunswick Service

Question 77. I was called upon to service a Carrier-Brunswick, 1/2 h.p. air-cooled condensing unit, which has not worked satisfactorily from the date of installation over a year ago. I found the job to be running short of methyl chloride and, after recharging the system, I got the following results:

Condensing medium, 65 degrees; back pressure, 14 lbs.; operating head pressure, 90 lbs.

This, according to your trouble chart issued in Volume 1, No. 4, still indicates shortage of gas, but I find if a heavier charge of gas is put in, as the back pressure drops, the head pressure goes up to around 240 lbs. On the off cycle, the head pressure drops to 60 lbs. A check for air in the system does not locate any. Can you give me any information as to what causes this condition as it increases the running time of the machine?

ANSWER: According to your statement of your refrigeration problem, apparently something quite unusual is wrong. The thing that occurs off-hand is that the liquid tube which takes the liquid from the bottom of the receiver may be faulty, or that the tube may not be in the system at all.

You state that if the refrigerant is added to the system, the head pressure goes up to an excessively high point. This indicates that the receiver is full of liquid refrigerant as is a greater part of the condenser. In that case, the trouble cannot be due to a shortage of refrigerant, and since the head pressure drops down to the normal point during the off cycle, it indicates that the receiver is probably very nearly full of refrigerant but that you are still not getting all liquid to your pressure-reducing device.

If there should be a liquid tube running from the bottom of the receiver into the liquid valve, and this tube may have become broken or disconnected, you might get the conditions you describe.

Another thing which has caused similar operation has been found to be a porous connection from the liquid receiver, where the tube in the liquid receiver passes into the liquid valve.

In either case, the system would operate in such a manner as you describe, the trou-

ble being that a mixture of liquid and vapor has probably gotten to the expansion valve instead of all liquid.

Frigidaire Motor Overload

Question 78. Where is the fuse on a Frigidaire Model EF, "motor model 3140."

I have hunted all over this model, under the pressurestat, in the box, on the motor, but with no success.

ANSWER: If I am not mistaken, there is no fuse on the Frigidaire model to which you refer. There usually is, however, a motor overload cut-out on it close to the pressurestat. This overload cut-out will open the circuit in case the motor is really overloaded for any appreciable period of time. It is reset by pushing in a small fibre button which comes out when the overload cuts out.

More Boat Refrigeration

Question 80. I will be grateful for any information you can give me on a contemplated refrigerator installation on a boat. I have a Servel compressor, Serial No. 27488, recently overhauled at the factory, and a heavy semi-steel "So-Cold" evaporator. I would like to know if it would be practical to use these two units together and, if so, what type of expansion valve and thermostatic control should be used with them.

ANSWER: In answering a similar question, I stated that the best possible refrigerator installation on a boat would probably consist in using a brine tank evaporator containing a eutectic solution of barium chloride and water, the solution to consist of 23% barium chloride and 77% water. This allows the evaporator to store refrigeration while the compressor is being driven, either by the power plant on the boat or by some auxiliary power supply. When the evaporator is thoroughly cooled, it will have sufficient storage of refrigeration so that it will not need to be cooled again for a period of from twenty-four to forty-eight hours in the ordinary refrigerator if the tank has a high brine capacity.

I do not know just exactly what the semi-steel "So-Cold" evaporator consists of, but I believe it is an evaporator which has no brine

and very little refrigeration storage capacity, and consequently the refrigerating compressor would have to be started and stopped frequently. This might be very inconvenient in the boat installation unless an electric storage battery system were in use.

The Servel compressor should work very satisfactorily on an installation of this kind. I would advise using an expansion valve with a methyl chloride system. Set the expansion valve to operate at about 6 lbs. gauge pressure. This will give a very low refrigeration temperature, and the suction line frost-back will be an indication that the

brine tank is thoroughly chilled. In all probability, this will require several hours of operation if the tank is at all warmed up.

Unless the system is to be operated from a set of storage batteries using an electric motor, a control switch has little value except in the case of a small engine which may be used for the sole purpose of driving the refrigerator compressor. If that were the case, opening a thermal control in series with the engine's primary ignition circuit would stop the engine, and it would have to be manually re-started.

(Continued on page 38)

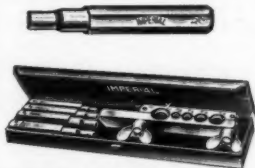
NEW MECHANICAL DEVICES Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer.

MAKING A JOINT WITHOUT USING A COUPLING

A handy swedging tool kit prepares tubes for soldering

A SET of swedging tools in a light metal case has been put on the market by the Imperial Brass Mfg. Co. It has been found very convenient for emergency work on tube connections. It takes care of occasions when the necessary fitting is not at hand, and too much time will be lost by waiting for one.



SWEDGING TOOL AND KIT FOR MAKING JOINTS.

The operation of joining the two pieces of tubing is easily performed by enlarging the inner diameter of one of them to permit the insertion of the other, and both portions are then soldered together. The enlarging is done by driving a swedging tool into the end of one of the pieces.

In the illustration, four swedging tools are shown, of $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ " and $\frac{3}{4}$ " O.D. At the right of the metal case is seen the slotted bar which holds the tubing while swedging takes place.

The whole outfit, complete in the case, sells for \$6.00. The tools are sold separately if desired, the set including $\frac{1}{8}$ " and $\frac{3}{4}$ " sizes as well as those named.

New Products in the Latest Imperial Catalog

The latest edition of the refrigeration catalog of the Imperial Brass Mfg. Co. is now off the press. As in earlier issues, it is in two colors, with the valves, fittings and service tools separately grouped for quick reference, and new items have been added to each group.

Among these is the new Imperial charging and testing unit, which has a variety of uses. The valves in this unit are the Imperial "Sylpak," which withstands an extreme degree of oscillation, without injury to the syphon. The flexible charging line has been made more adaptable, and is equipped, when required, with replaceable copper extensions.

The new catalog is loose-leaf, like earlier issues; serial number, 77-D. A copy may be obtained by any service man.

NEW MONJIAN CATALOG NOW READY

TO take care of the hundreds of requests made by the trade, the George Monjian Company, 860 E. Grand Avenue, Chicago, Ill., has prepared an attractive new catalog. This company handles a complete line of replacement parts, supplies, tools, and gases for both domestic and commercial refrigeration.

The new catalog is well illustrated and net prices are shown for the convenience of the customers. With the many other items that go to make up this well-planned book are shown nationally advertised products, among which are: a complete line of Fedders products; Zerozone 1/6-hp. to 3-hp. condensing units; Marshalltown gauges; Gilmer belts; and Fedders, Detroit Lubricator, Mayson, and American Injector expansion valves. The catalog shows a complete line of all sizes of tubing, flapper valves, replacement parts, service men's tools, and all kinds of refrigerants.

Mr. Monjian, president of the company, has been actively engaged in the refrigeration industry for over 25 years. With his extensive experience and knowledge of the industry, he has made an effort to present a catalog complete in every respect, one that will be helpful to the busy service man.

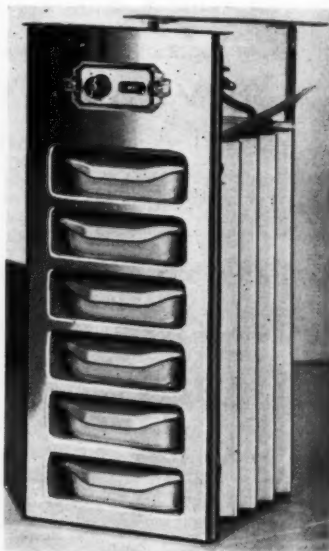
The company maintains a complete modernly equipped shop and is prepared to make special parts and appliances. Its lengthy experience and up-to-date facilities enable it to handle all kinds of refrigeration repair work at prices of interest to the trade.

The refrigeration industry is being favorably affected by the general up-turn of business conditions and the George Monjian Company organization is looking forward to a big season. Its mail-order business is being developed to better take care of service men's requirements all over the country.



STANDARD EVAPORATORS AND ICE CUBE MAKERS

THE Standard Refrigeration Parts Co., 5101 W. Madison St., Chicago, have just announced the enlargement of their line of dry expansion evaporators to be used by service men in the replacement of obsolete and defective brine tanks of all sizes and types which are now in service and originally installed in units by the various box manufacturers.



NEW STANDARD COOLING UNIT.

Of particular interest to refrigeration service men is the fact that they can obtain special size domestic dry evaporators not only to replace the obsolete brine tanks but also to sell their customers on the idea of modernizing their refrigerators.

Standard evaporators are manufactured 100% in copper and brass. The tubes are of 3/4" with .035 thickness and are metallically bonded beneath and above each sleeve to insure faster freezing of ice cubes. The continuous tube principal involved in the manufacture of these evaporators prohibits the possibility of oil binding.

The REFRIGERATION SERVICE — ENGINEER —

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 3 June, 1935 No. 6

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Official Organ

REFRIGERATION SERVICE ENGINEERS' SOCIETY

MUNICIPAL ORDINANCES

MUNICIPAL codes are adopted as safety measures in the installation and servicing of refrigerating equipment. Their primary purpose is to protect the life and property of purchasers of refrigeration service and equipment, and usually are formulated with the best interests in mind of all concerned. This is fine if they are intelligently compiled and subsequently enforced.

Service men welcome the adoption of such codes for the establishment of definite standards and approved practices of installation, which will eliminate other than approved installations by men who are not familiar with refrigeration. We believe that the adoption of such municipal codes has been made to thoroughly cover the best practices, but oftentimes we learn that other interests from a selfish point of view have been successful in having provisions incorporated therein that are not feasible or pertinent to the code. This usually leads to some minor violations of the code, weakening its entire structure and, as a consequence, the practice grows and all provisions are more or less ignored and the ordinance becomes just another regulation which has been

placed on the books, but apparently impossible of enforcement. Periodically, it is revised in an endeavor to enforce its provisions, and for a time is successful, but usually again lapses into a state of inactivity. It is agreed that refrigeration installations and service should be put into the hands of men qualified to do this work. From a safety measure, it is too precarious to the general welfare of the public to have this business entrusted to other than those whose training or experience has fitted them for this work. After all, it is a specialized engineering business.

As the men engaged in the business are most concerned with the adoption of any such municipal regulations, it is important that they take an active interest in the writing or revision of any such ordinances. Such ordinances must be assured of an honest enforcement without prejudice. They should be written by the men whose experience in the field has dictated the best standards of practice to follow.

What type of ordinance will be most effective depends, to some degree, on local conditions. Refrigeration progresses rapidly. Consequently, there are some ordinances in force today which have outlived their usefulness because of more recent development in refrigeration equipment and installations, and should have a thorough revision. With the advent of air conditioning, there is further necessity for regulation, and in most municipalities, the health department is concerned with such installations.

K. R. Bircher, Texas.

This servicing business is growing so rapidly, that it urgently needs a trade paper, such as the REFRIGERATION SERVICE ENGINEER to chronicle the changes that are rapidly taking place. Your magazine has made splendid progress and I watch for each issue.

H. J. Dickinson, New York.

Enclosed you will find money order for \$1.00. Kindly send binder for the R. S. E. It is an excellent publication. The publishers deserve high commendation for their splendid work.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.



THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Kansas City and Memphis Chapters Receive Charters

KANSAS CITY and Memphis have now been enrolled as regularly constituted chapters, having received their charters from the national headquarters' office.

On June 4, at a special meeting called by President S. A. Leitner, of Kansas City Chapter, with twenty-eight present, National Secretary H. T. McDermott was introduced by the Chair and after a brief talk on the activities of the Society presented the Chapter with its charter.

The following is a report of the meeting by Mr. C. F. Ramey, secretary:

Charter Presentation Meeting of June 4

Kansas City Chapter held its special meeting at the Commonwealth Hotel, and after the usual business had been disposed of, President Leitner requested the Secretary to read the communications received. The first communication was a letter from the National Secretary's office answering a question which arose in our Chapter relative to the dividing line in the field from which applicants might be drawn as regards the small commercial system installation and service men and the men from the field of air conditioning and larger commercial systems. The second communication was from our National President T. J. Fowler, welcoming Kansas City Chapter into the National Organization.

President Leitner then gave the meeting over to National Secretary McDermott, who gave us a very fine talk reviewing the ideals of the Society as a national organization, after which he administered the oath to the

members present and presented the charter. President Leitner accepted on behalf of the Kansas City Chapter.

Future plans were discussed and National Secretary McDermott assured us his office would render all assistance possible in helping Kansas City Chapter grow into an important link in the national organization.

Meeting adjourned after President Leitner announced that a start would be made at the next meeting on the study of the material contained in Lecture No. 1 sent out by the National Educational Committee.

Memphis Chapter

A special meeting of Memphis Chapter was held for the receipt of its charter from the National Association and was preceded by a delightful banquet at the Hotel Chiscon. After the dinner, President W. H. Moss stated that inasmuch as the principal reason for this meeting was the presentation of Memphis Chapter's charter, he would dispense with any business, and turned the meet-

ing over to Secretary McDermott.

After a brief address the National Secretary presented President Moss with the charter, and following this activity the members present entered into a general round-table discussion of the activities of the National

Society and of Memphis Chapter in particular.

These two chapters with the active membership which they represent will be important factors in the progress of the National Society's activities.

Preliminary Plans for Second Convention Announced

PRELIMINARY plans for the second annual convention of the Refrigeration Service Engineers' Society at Detroit, Wednesday, Thursday and Friday, October 23, 24 and 25, have been announced. Several committee appointments are yet to be made and will be announced in a future issue.

Mr. Paul Jacobsen, president of Chicago Chapter, has been appointed as chairman of the Program Committee and he will be assisted by other members on this committee representing the various chapters.

The program will be planned to include the presentation of educational papers and dis-

cussions during the morning sessions, with the afternoons reserved for visits to factories of the various manufacturers of refrigeration accessories located in Detroit.

One of the features of this convention will be the manufacturers' exhibit, which will be a display of the products of the various manufacturers and jobbers of refrigeration parts and accessories. Space has been provided adjacent to the meeting hall for the various exhibits, and charts of the floor plan showing the sizes of the various spaces available will be prepared and mailed from the National Secretary's office very shortly.

REPORT ON THE NEW STANDARD ACCOUNTING SYSTEM

THE Standard Accounting System for the Refrigeration Service Engineers' Society is now definitely on its way to realization. On May 31, the Cost Committee met with its Consulting Accountant, J. B. Cook, and reviewed the revised forms he presented for the new Standard Accounting System.

In the near future it is expected that the first forms (Class C) will be finally approved; and tentative arrangements have been made for the publishing of this standard system. The plan will be to have these forms placed in stock and made available immediately to members of the Refrigeration Service Engineers' Society in almost any quantity, large or small, at a price considerably less than the individual member himself could have them printed for. "Class C" will be especially and exclusively the best possible system for members of the Society who wish to have the minimum of records. Instructions will be clear and complete and easily followed out.

"Making Records Pay" has been our motto in the preparation of these forms. Our most

diligent efforts have been directed to accomplish this purpose in the most complete and yet the easiest manner possible for those having their own individual business. They will be both easier to handle and better to have as records. The Committee on Cost Records has not lost sight of the different conditions and kinds of businesses. That is all allowed for. Yet these forms, without any useless details, will give to the busy service man the necessary facts with a minimum of effort and time. As his business develops, some additional forms will undoubtedly be desired and these will also become a part of the Standard Accounting System for larger business organizations.

As soon as these "Class C" forms are ready for sale to the members, more developed forms will be presented to the Committee as "Class B." These more developed forms are for businesses that are growing and obviously must need additional records. The Committee has not forgotten by any means that the growing business calls for more extended records, but it is going to start out with the basic records necessary for your business. These forms will be the stepping stone to more complete records.

The standard list of accounts has not yet

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been completed, but a first draft already has been considered by the Committee on Cost Records, and later on, this standard list of accounts will also be completed. The cost of this system will be kept down as low as possible and its design is exclusively for you, Mr. Refrigeration Engineer.

§ § §

DETROIT CHAPTER

By JAMES E. PERRY, Secretary

Meeting of April 16

AFTER the usual transaction of the business meeting, Mr. Owen Nelson of the Riley Engineering Company delivered a very interesting lecture on the products which this company is now manufacturing, and we desire to congratulate Mr. Nelson on the interesting way in which he presented his talk.

April 20 Dance

Not forgetting that "all work and no play makes Jack a dull boy," Detroit Chapter held

a dance at the Tuller Hotel, which proved quite a success. When we mention success we are not talking entirely about the financial success of the venture but we can report a most excellent crowd, good music and several acts of magic contributed to making this evening one of real pleasure for the members and their families.

Meeting of May 1

President James H. Downs asked for reports from the various committees—particularly the Entertainment Committee as to the success of our entertainment on April 20. An open forum discussion was held on the merits of the addition to our refrigeration code. Mr. George H. Clark, national educational chairman, gave a short talk on "Heating by Refrigeration."

Mr. Murphree announced that all of the members were invited to attend a birthday party being held at the Mundus Brewery that evening, so the meeting adjourned.



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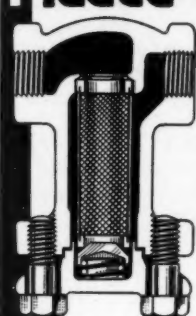
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PITTSBURGH CHAPTER

By F. V. GOLITZ, Secretary

Meeting of May 13

THE meeting was held in the office of the Kramer Auto Radiator Co., 5114 Liberty Ave., President McCauley presiding, with an attendance of twenty-five.

The meeting was called to order by President McCauley. The minutes of all the previous meetings were read by the Secretary. Minutes were accepted as read.

The Constitution and By-Laws were read and after discussion of the By-Laws and correction of same it was moved by Mr. Waight and seconded by Mr. Dvorsky that the Constitution and By-Laws be adopted. Motion carried.

The following were appointed by Mr. McCauley to serve as the Membership Committee: Mr. F. V. Golitz, John Kirch and H. S. McCloud.

It was decided to postpone the election of the chairman of the Educational Committee until the next meeting night when the members of the other committees will be appointed.

The Secretary read the correspondence and made a plea for prompt payment of dues.

It was moved by Mr. Entwistle and seconded by Mr. Ross that a downtown location be selected for the subsequent meetings; motion carried.

It was moved by Mr. Black and seconded by Mr. Davidson that President McCauley try to have an engineer from the Ansul Chemical Company give a talk on refrigerants at the next meeting; motion carried.

Business session was closed.

Mr. Kramer of the Kramer Auto Radiator Company, Trenton, N. J., a pioneer member of the Refrigeration Service Engineers' Society, gave a talk on "Heat Transfer Devices."

§ § §

KANSAS CITY CHAPTER

By C. F. RAMEY, Secretary

Meeting of May 14th

KANSAS CITY Chapter No. 1, Refrigeration Service Engineers' Society, held its meeting at the Commonwealth Hotel, 1215 Broadway, Kansas City, Mo.

President Leitner emphasized the importance of closing any prospective members that final arrangements might be made for acceptance of our charter from the National Association at an early date.

The meeting at this point was turned over to Mr. W. R. Jones, chairman of the Educational Committee, who introduced Messrs. Robb, Eveleth and Johnson of the Minneapolis-Honeywell Regulator Company. These gentlemen with the aid of screen pictures gave a very interesting and educational talk on temperature controls, their manufacture, tests, uses and application to refrigeration purposes. The pictures showing the facilities for testing and proving these controls under actual working conditions and temperature were very entertaining as well as instructive.

After this interesting feature, the meeting was turned back to President Leitner, who reviewed the objectives of the Society. Questions were answered for new applicants.

Meeting adjourned with everyone looking forward to more interesting educational features.

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CHICAGO CHAPTER

By H. D. BUSBY, Secretary

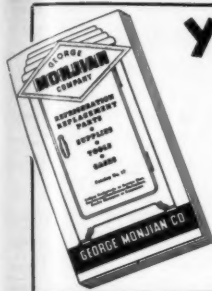
Meeting of May 14

EXPRESSIONS from all those called upon were to the effect that the banquet was very enjoyable and a complete success. A vote of thanks was extended to Mr. Goldberg and Mr. Skipple for their hard work and efforts in making this such a successful evening. He outlined a future entertainment program, including a smoker approximately six weeks from date, and a picnic sometime during the summer.

For the educational feature of the evening, Mr. Fowler gave his findings and experience on shop management in general.

Mr. Vanston presented a Frigidaire installation and service bulletin to the Society for the use of its members and promised to supply more as they were received by him.

A thick bluish haze, which made visibility very poor during the meeting, was the result of Mr. Jerrick's much appreciated gift of a box of cigars. Mr. Jerrick of the Grainger



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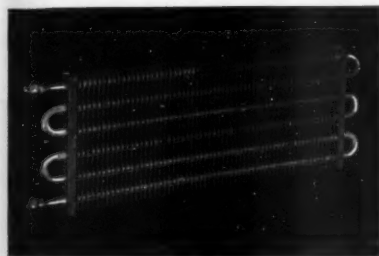
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SYCAMORE, ILL.

Motor Company was a guest for the evening.

President Jacobsen pointed out that the educational program for the first quarter has been almost completed and urged the members to make suggestions for the next quarter. The suggestion box was passed around and a few requests received.

Considerable discussion arose as to the desirability of forming a Code of Ethics through which greater uniformity in practices could be brought about. Several points of the code were discussed and suggestions made. It was finally decided that inasmuch as all members may not be interested in these discussions special meetings would be called for the discussion and formulating of the code to which only members interested would be invited to attend.

Meeting of May 28th

The meeting was called to order at 8:10 p. m.

Officers present were: Messrs. Jacobsen, Northcote, Roth, Busby and Skipple.

Minutes of the previous meeting were read and approved.

The regular orders of business were dispensed with very rapidly. Almost the entire evening was devoted to a very interesting illustrated talk on the method of manufacture and the various uses of SO_2 by Mr. Johnson of Virginia Smelting Company. Mr. Strauch of Innes Spieden Company was also a guest for the evening.

MEMPHIS CHAPTER

By E. B. JOHNSTON, Secretary

Special Meeting, May 23rd

THE meeting was called to order by Mr. Moss, president, who welcomed and introduced two speakers for the evening, Mr. Chas. W. Johnston and Mr. Strachan, the former general manager of the Virginia Smelting Co. and the latter assistant sales manager of Kerotest Mfg. Co.

Mr. Johnston gave an interesting lecture on refrigerants, also answering questions as well as showing a moving picture of his plant and how SO_2 is made. We all enjoyed his lecture and picture.

Mr. Strachan gave us a talk on valves and fittings which was beneficial as well as instructive.

CHICAGO CHAPTER CHATTER

By HERMAN GOLDBERG

OUR members must be socially and pleasantly inclined. Now that the banquet is over they are asking your entertainment committee to inaugurate a picnic for members and friends and a smoker for members only.

The banquet, as you all know, was a success, as without exception everybody who attended had a wonderful time. The dance music and the hired talent for entertainment were exceptionally fine and above all, everybody present seemed to feel it their duty to see that the other fellow had a good time, and the party broke up in the wee hours of the morning only when the orchestra simply had to quit because of sheer tiredness.

The ladies apparently enjoyed the show and the dance, and your entertainment committee promises that another affair of this kind is slated for some time during the fall.

That's all for the banquet except that our president, Mr. Jacobsen, got decorated by the Royal Order of Traffic Cops for going down to the hotel in too much of a hurry. Oh, well. It was all for a good cause.

There is a show in town about three men on a horse which isn't any funnier than Jake, Skip and myself sitting up in a cold, dark meeting room after the last meeting until 8 o'clock in the morning figuring up the cost of the banquet and how to make better and bigger affairs.

I just got a flash about one of our leading lights, Mr. Tom Fowler, who in the course of inhaling a substantial amount of SO_2 suddenly found it necessary to expectorate, but made the mistake of not finding out if the clean window was open or closed. Unfortunately, the lady of the house was present. Was Tom's face red?

We close again for the present but don't forget I'm still at the same address, 5101 W. Madison St., or phone me at Austin 6343 with your fresh news and scandal.

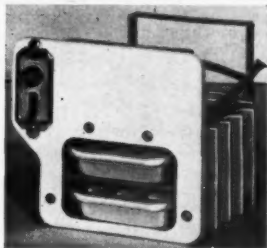
Don't forget the National Convention in Detroit this coming October.

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4 CUBIC FEET

\$5.95

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FRAUDLERS REFRIGERATOR PARTS, 333 Plymouth Ave., S. Rochester, N. Y.
SPANGLER COMPANY, 3337 Market St., St. Louis, Mo.
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DOLISON WITH COMMERCIAL COIL & REFRIGERATION CO.

D. H. DOLISON has recently been appointed general manager of the Commercial Coil & Refrigeration Company, Chicago, Illinois.

Mr. Dolison has for the past twelve years been continuously active in the commercial refrigeration industry, having been until very recently, with Brunswick, Balke, Collender Company on special sales and development work pertaining to commercial refrigerating and its application to beer dispensing fixtures.

For over four years previous to that he was general sales manager of the Temprite Products Corporation, which company he and H. C. Kellogg organized and developed.

Commercial Coil & Refrigeration Company has developed a new beer cooler with many advanced features and expects to sell it together with other refrigerating appliances to distributors, dealers and jobbers.

The manufacture of finned coils will be discontinued except on special order.

VIRGINIA SMELTING APPOINTS NEW DISTRIBUTORS

IN broadening the distribution of "Extra Dry Esotoo" and "V-Meth-L" manufactured by the Virginia Smelting Co. of West Norfolk, Va., new distributing agencies are announced.

The appointment of these new distributors is in keeping with the policy of the company to provide more convenient and economical outlets to better serve its customers.

The new agencies include:

In Nashville, Tennessee, Middle Tennessee Electric Company, 105 First Avenue, South.

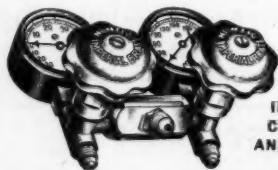
In Texas, Fort Worth, Baker Ice Machine Company, 509 East Third Street, and in Tyler, Texas, Walter Connally & Company.

In Burlington, Vermont, The G. S. Blodgett Company, at 190 Bank Street.

In New York City, National Air Conditioning Company, 102 Fifth Avenue. The Perry Metal Products, Inc., 1127 Atlantic Avenue, New York City, will represent us on the sale of Methyl Chloride only.

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ALL Imperial service tools are designed for faster and more expert work, and all valves and fittings are especially made for exacting refrigeration service.



IMPERIAL CHARGING AND TESTING UNIT

For removing refrigerants, testing for leaks, preparing for charging, etc. Equipped with Imperial "Sylpak" shutoff valves (operated on the syphon principle).

200-C \$5.75

IMPERIAL TUBE CUTTER



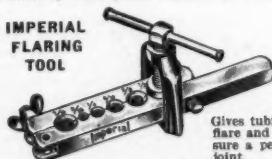
Makes a clean right-angle cut quickly and easily. For copper, brass and black tin tubing. $\frac{3}{8}$ " to $\frac{1}{2}$ ". 94-F \$2.30

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Perfectly flexible, with brass core and 2 corners. Length 25 $\frac{1}{2}$ ". Outer covering unaffected by oil or grease. 285-FT. \$1.10

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Order from your jobber.

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In White Plains New York, County Seat
Plumbing Supply Co.

In Newark, New Jersey, T. W. Binder, 25
S. Orange Street.

J. E. PERRY CO. MOVES

THE capable and efficient secretary of Detroit Chapter, Refrigeration Service Engineers' Society, James E. Perry, has found it necessary to secure larger quarters for his servicing business. The new location is 5309 Hamilton Avenue, Detroit, Mich. These new facilities will afford the further continuance of the company's policy of "specialized refrigeration" service.

Mr. Perry's many friends wish him continued success in his new and improved quarters.

AIR CONDITIONING BOOK PREPARED BY MINNEAPOLIS-HONEYWELL


A MOST attractive book of 32 pages and cover, 7x10 inches in size, has recently been issued by the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., entitled, "This Thing Called Air Conditioning."

The book is a discussion in simple everyday English of the six cardinal factors governing all-year-round conditioning of the air, the primary requisites for successful conditioning; a discussion of the various systems and the importance of automatic control to the proper operation of any system, large or small.

From the preface of this interesting book, we reprint in part the purpose for which it was published:

"So many elements play a part in air conditioning, that an understanding of all of them is important. This book, then, has been written to answer these questions in simple, everyday language, understandable to everyone."

"Minneapolis-Honeywell Regulator Company manufactures and sells no air conditioning apparatus, nor have we any desire to design or install complete air conditioning systems. Yet for fifty years we have pioneered and led the field of automatic control,



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*Accept
NO SUBSTITUTE
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EXTRA DRY ESOTOO
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Recognized, the world over, as a highly reliable refrigerant—as free from moisture and impurities as human skill can make it—every step in production under rigid technical control.

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131 State St., Boston, Mass.

Send me the literature I have checked. I am interested in receiving any additional literature on Electrical Refrigeration you may issue from time to time.

- ☐ Folder: Extra Dry ESOTOO (Liquid Sulphur Dioxide)
- ☐ Folder: V-METH-L (Virginia Methyl Chloride)
- ☐ Folder: Transferring from large to small cylinders
- ☐ Circular: Physical properties of various refrigerants.

Name

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City & State.....

without which satisfactory air conditioning is not possible. We can, therefore, be unbiased in this discussion of air conditioning ways and means, and, as a result of our experience and research, are qualified to discuss the subject in perspective from all angles.

"We offer then, this book, without prejudice for or against any particular type of air conditioning system, but rather to show the important part which automatic controls play in the operation of these systems, and the absolute necessity for planning this control as an integral and important part of this operation. It is our hope it will prove a source of information and help to all prospective users of air conditioning equipment and will be, as well, a service to the air conditioning industry."

§ § §

"ERMSTAT" DISTRIBUTOR

THE Electric Refrigeration Motor Co., Inc., Philadelphia, Pa., has recently appointed Melchior, Armstrong, Dessau Company as sole distributor for the eastern United States and foreign countries for the motor overload protector "Ermstat," manufactured by their company.

§ § §

QUESTIONS AND ANSWERS

(Continued from page 25)

Gibson Hermetic Unit

Question 82. I am servicing two model G-H Gibson Hermetic units and there is a very pronounced click in the pistons when the motor is running. One unit is a year old and the other possibly three years old. The noise sounds like the pistons are dry or they are striking very lightly the cylinder head. The unit is floating free on the mounting springs and the cooling fan is not striking anything. I have an idea that the oil has been pumped out of the motor into the evaporator. If I am right, how can I get it back? The factory says that oil cannot be pumped out and that the pistons never get dry, but I know that something is wrong.

ANSWER: According to your description of the noise in the Gibson Hermetic unit, I presume that the click that you refer to is in the discharge valves in the compressor. If the pistons were striking the cylinder head

at all, the knock would probably be of a fairly heavy nature. If the noise may be described as a click, it is more likely to be the discharge valves.

In some cases, the noise caused by the discharge valves may be minimized or eliminated by removing the cylinder head and making some adjustment on the discharge valve so as to cut down on the amount of lip on the valves.

This clicking noise apparently occurs quite frequently in this type of machine. This model Gibson uses a high-side float in connection with a flooded evaporator and it is possible that the quantity of oil in the compressor may be variable.

In some cases, the oil may be returned to the compressor by adding a small quantity of refrigerant; or perhaps we should say that if the quantity of refrigerant is low in the high side float valve system, the oil may not return properly to the compressor due to the difference in level in the return line in the evaporator and the evaporating level.

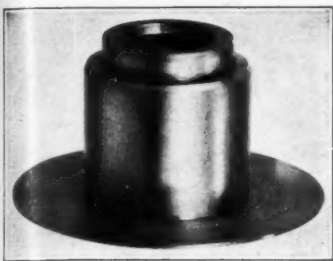
Question 83. Will you please give me the following information on the changing of a Penn Electric water valve "S by L" No. M4564, now installed on a methyl chloride Baker compressor, 1-hp. twin-cylinder opposed machine? Would like to know if the connection which the water valve is fastened to on the sump tank or receiver, which has a 1/4" flare fitting, has or has not a check valve on the inside of the fitting, or whether this water valve can be changed without discharging the receiver.

ANSWER: The flare fittings attached to the liquid receiver have a check valve on the inside of the fitting, and consequently, the valve may be changed without discharging the receiver.

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This Karlberg, New Design, Compressor Seal Unit, is built to supply the need for a universal seal without soldering or fitting. Removable nose piece makes it possible to fit the seal to nearly any make or model of machine by merely inserting a longer or shorter seal nose piece. Available for either $\frac{1}{8}$ " or $\frac{5}{16}$ " shafts, or larger if specially ordered. Write today for prices and full information.

Trico Compressor Service

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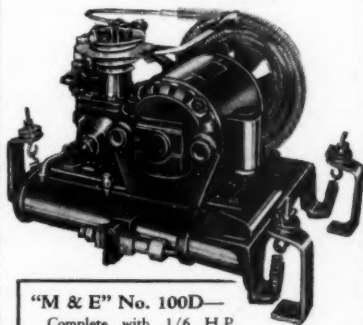
ANSUL SULPHUR DIOXIDE ANSUL METHYL CHLORIDE

It pays to buy Ansul Sulphur Dioxide and Ansul Methyl Chloride for you can be certain that the contents of every cylinder have been analyzed. You take nothing for granted for the results of the analysis are attached to the cylinder for your inspection. Be certain of high quality . . . specify Ansul Refrigerants.

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"M & E" No. 100D—

Complete with 1/6 H.P.
Motor and Spring Suspension.
Code—DOMK.

With Motor

"M & E" No. 120MC—

Complete with 1/6 H.P.
Motor and Spring Suspension.
Code—DOMM.

\$33.50

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"M & E" No. 100D—

Complete without motor
with Spring Suspension.
Code—DOMF.

No Motor

"M & E" No. 120MC—

Complete without motor
with Spring Suspension.
Code—DOMH.

\$22.50

net cash

"M & E" No.

100D (SO₂)

Code—DOMB

"M & E" No.

120MC

Code—DOMD

(CH₂CL)

(With Flywheel
and Valve)

\$12.00

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If you are actively engaged in this profession, identify yourself with the organization which represents your interests. We suggest you write to National Headquarters for complete information as to how this Society is serving its membership.

A Local Chapter . . .

in your city. The National Society will aid in the formation of a local chapter. Ten or more active service men are required to form a chapter. The National Society will assist.

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☐ Please send me information regarding membership in the Society.

☐ I would like to have further information as to the formation of a local chapter in my city.

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City and State

Household Refrigeration

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NICKERSON & COLLINS COMPANY, PUBLISHERS, 435 N. Waller Avenue, Chicago, Ill.

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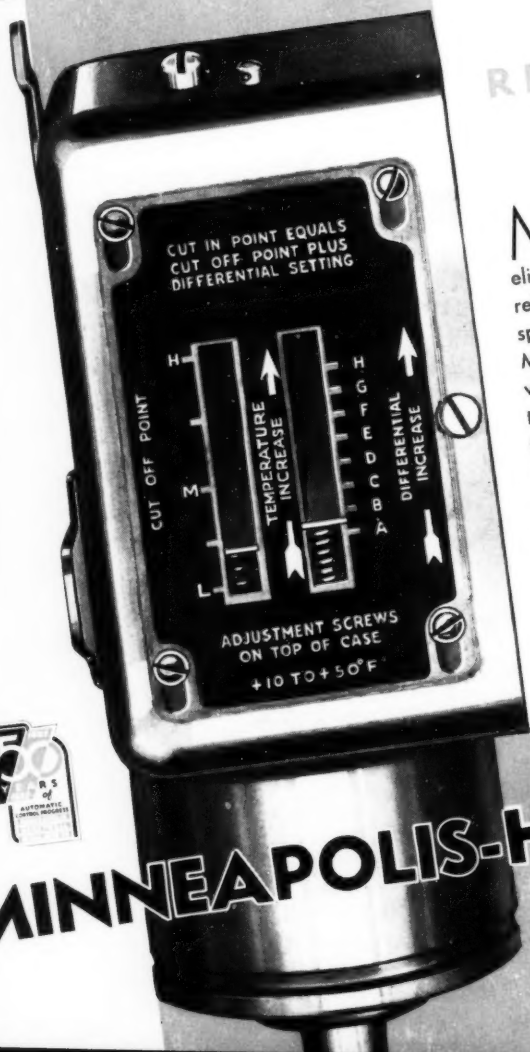
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MINNEAPOLIS-HONEYWELL Refrigerator Controls, because of their visible scales, eliminate guesswork in installing and adjusting refrigeration equipment, and consequently speed service and lower its cost. Con-Tac-Tor Mercury Switches provide sure-fire operation without moisture corrosion and pitting of contacts. Minneapolis-Honeywell Refrigeration Controls are available in all desired temperature and pressure ranges, and best of all, they cost no more. One experience with them will convince you of their superiority. Minneapolis-Honeywell Regulator Company, 2934 Forest Avenue South, Minneapolis, Minnesota.

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